
Hidden sector searches with low-energy neutrino scattering detectors

Dan Pershey, for the COHERENT experiment

P5 Town Hall

Argonne, Mar 23 2023

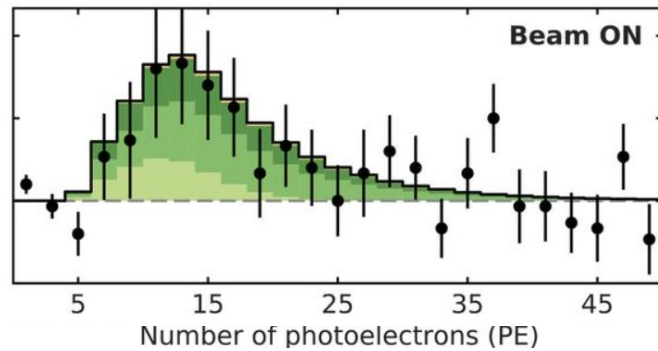


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Coherent neutrino scattering at the Spallation Neutron Source



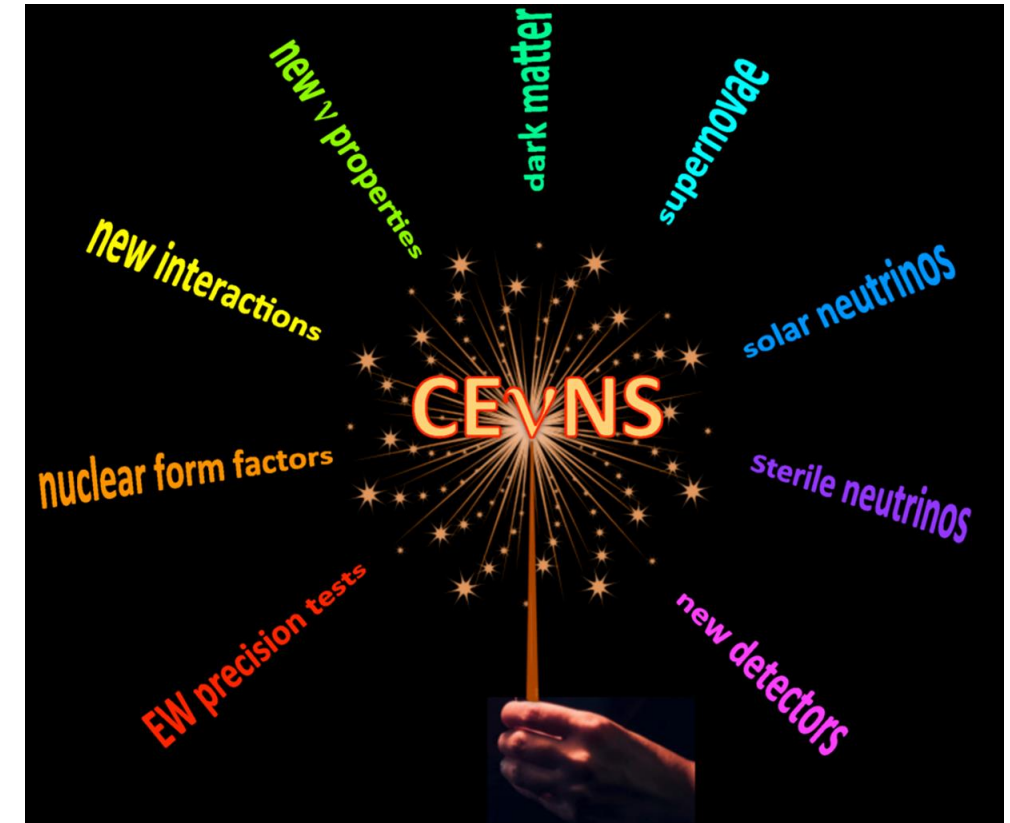
Coherent elastic neutrino-nucleus scattering (CEvNS)

First measurement: COHERENT (2017) with CsI[Na] scintillator



COHERENT, *Science* **357** 6356 (2017)

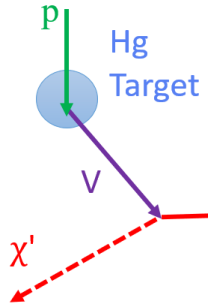
Applications of CEvNS measurements



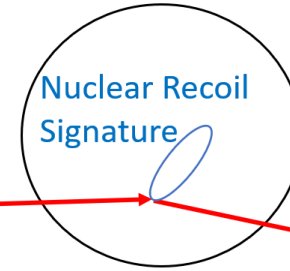
E. Lisi, Neutrino 2018

Searching for dark matter with CEvNS detectors

SNS proton beam



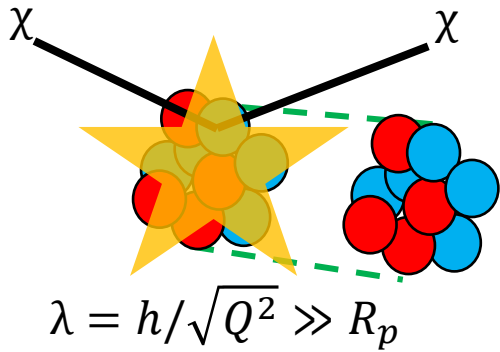
COHERENT detector



A typical beam dump experiment

Vector DM portal => production of DM comes from meson decay in flight: $\pi^0 \rightarrow V\gamma$

CEvNS detectors get the best of both worlds!

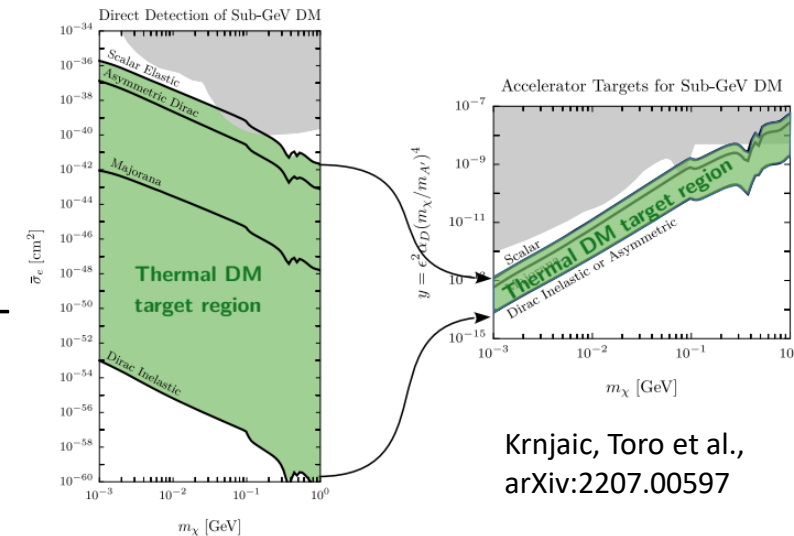


Detect DM via coherent scattering – large cross section

Advantage: direct detection experiments (and COHERENT!)

DM at accelerators is relativistic and less sensitive to DM nature

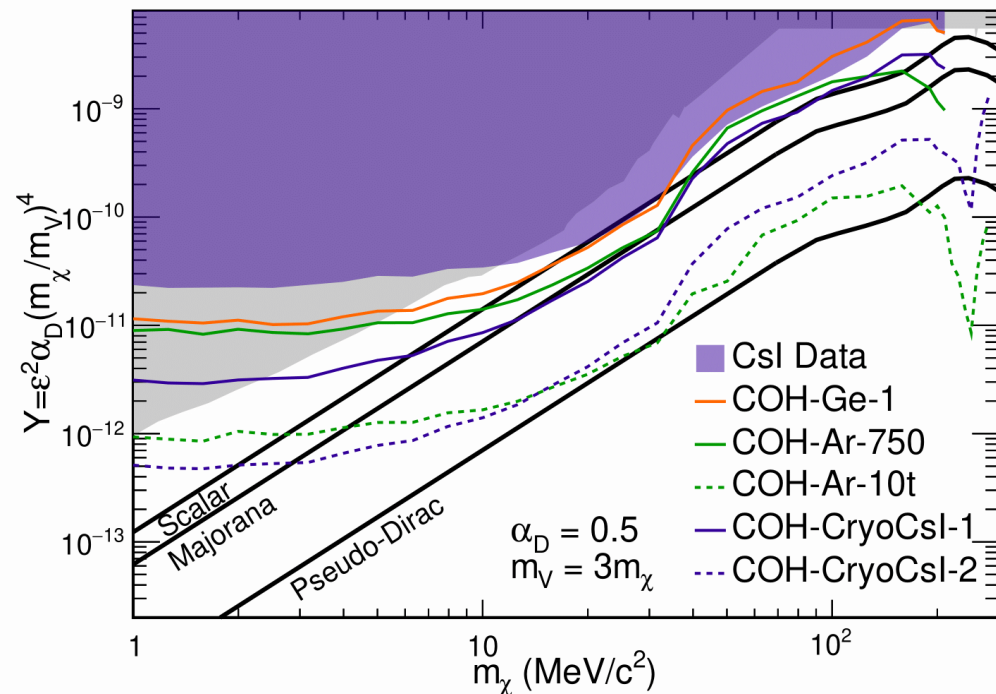
Advantage: accelerator-based searches



Future potential for DM discovery

Key: construction of second target station at the SNS allows detector hall for 10t-scale neutrino experiments

Several potential CEvNS detector technologies – e.g. an argon scintillation calorimeter



Future CEvNS detectors at the SNS allow 1000x larger exposure than current COHERENT datasets

Allows aggressive probe of scalar and fermion sub-GeV DM with a direct detection experiment